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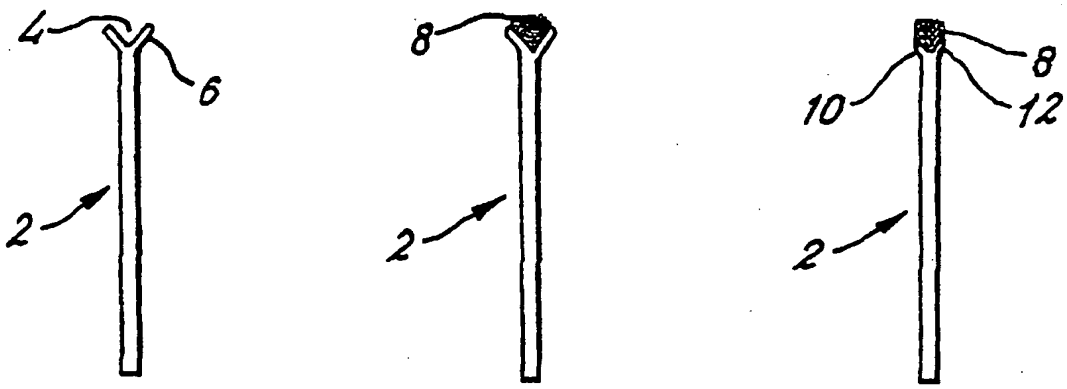
(54) Title: A METHOD OF MAKING A SAW BLADE



(57) Abstract: A method of making a saw blade comprising forming at least one recess (4) along an edge (6) of a support strip (2), and securing in the recess (4) at least one material (8) providing, or enabling the provision of, a sawing edge. Individual saw teeth (16) may be inserted into the recess (4) to form the sawing edge. Alternatively, the recess (4) may be filled with tungsten powder (8) sintered to form a hardened edge into which the saw teeth (14) are formed. Alternatively, the recess (4) may be filled with a mixture of tungsten grit and braze material, and heated to form a hardened edge into which the saw teeth are formed. Alternatively, a series of short lengths of tungsten carbide strip may be inserted into the recess (4). The recess (4) may be mechanically closed after having been provided with the material providing, or enabling the provision of, the sawing edge.

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A METHOD OF MAKING A SAW BLADE

This invention relates to a method of making a saw blade, and to a saw blade so made.

Saw blades such for example as hacksaw blades and bandsaw blades, are usually made from a bi-metal strip comprising a cutting edge of high speed steel attached to a support strip. Cutting teeth are cut into the blade edge, typically by electron beam butt welding. The support strip may be a high carbon steel support strip.

Saw blades such for example as hacksaw blades and bandsaw blades are also made by attaching at least one abrasive material to a support strip. The abrasive material may be attached by, for example, brazing, welding or fusing. The abrasive material may be tungsten grit, diamond powder, or a sintered material such for example as a sintered ceramic material. Because of the abrasive material, the cutting edge of the saw blades does not have conventional or regularly spaced teeth such as would be the case with a saw blade having a high speed steel edging. This lack of conventional or regularly spaced teeth may be disadvantageous in certain applications.

Toothed saw blades employing pre-formed tungsten teeth individually attached by brazing to the edge of a support strip have been made. However, their manufacture is costly and slow. Also, it is difficult to make a saw blade with more than some ten teeth per inch.

Additionally, each facet of the tooth is ground individually from a cylinder or sphere of tungsten carbide. This is a complicated and time consuming process.

It is an aim of the present invention to provide an improved method of making a saw blade.

Accordingly, in one non-limiting embodiment of the present invention there is provided a method of making a saw blade, which method comprises forming at least one recess along an edge of a support strip, and securing in the recess at least one material providing, or enabling the provision of, a sawing edge.

The recess may be formed in the edge of the support strip by rolling.

The recess may be one of a number of shapes. Thus, for example, the recess may be V-shaped, U-shaped, or part circular in section.

A plurality of individual saw teeth may be inserted into the recess to provide the cutting edge. The individual saw teeth may be made of diamond, tungsten carbide, a sintered metal, a sintered ceramic material, or mixtures of these materials.

Alternatively, the recess may be formed with tungsten powder, subsequently compressed and sintered to form a hardened edge to the support strip, into which edge saw teeth may be cut or ground. The sintering and the tooth cutting may be achieved by means of at least one of a laser beam, diamond grinding and wire erosion.

The recess may alternatively be filled with a mixture of tungsten grit and braze material, which may be subsequently heated to form a hardened edge into which saw teeth may be cut or ground.

Alternatively, the recess in the support strip may be provided along its length with a plurality of shorter lengths of tungsten carbide strip, separated one from another. The lengths of tungsten carbide strip may be attached to the support strip by means of brazing, welding, or fusing. The lengths of tungsten carbide strip may have teeth formed in them prior to assembly with the support strip, or the length of tungsten carbide strip may have teeth cut in the lengths after assembly with the support strip.

In another aspect, the present invention provides a saw blade made by the method of the invention.

The manufacture of the saw blade in accordance with the present invention provides a number of advantages over prior art methods. For example, using the method of the invention, it is possible to manufacture a saw blade with a cutting edge of greater width than that of the support strip.

Also, the use of the support strip with the recessed edge enables the manufacture of a continuous or near-continuous bi-metal saw blade. Such a saw blade may comprise a strip of steel and a cutting edge material. The cutting edge material may be, for example, tungsten, diamond, or a sintered material. The sintered material may be, for example, a ceramic material. The cutting edge material provides, or subsequently has formed in it, the cutting edge.

The use of the recessed edge also enables individual small saw teeth to be quickly and accurately placed on, and affixed to, the steel strip. This enables the saw blade to be provided with a greater number of teeth per inch than was possible with previously known methods of manufacture employing individual attachable saw teeth. Following the placing and attachment of the individual saw teeth in the recess formed in the support strip, the recess may be mechanically closed upon the teeth, thereby giving an additional mechanical grip upon the individual teeth.

The recessed edge also enables pre-sintered carbide powder intended to form the saw blade edge to be pressed into position in the recess prior to curing. The curing may typically be means of a laser, electron beam energy, or induction techniques.

Embodiments of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:-

Figures 1-5 show different stages in the manufacture of a saw blade by a method of the invention.

Referring to Figure 1, there is shown an end view of a support strip 2 which is made of rolled steel. A recess 4 is provided along an upper edge 6 of the support strip 2.

Figure 2 shows how tungsten 8 is provided in the recess 4. The tungsten 8 may be in powder form and it is brazed into position in the recess 4.

Figure 3 shows how edges 10, 12 have been ground to leave material for a cutting edge, also known as a saw kerf.

Figure 4 is a perspective view of the support strip 2 as shown in end view in Figure 3.

Figure 5 shows how the support strip 2 shown in Figure 4 is then provided with teeth 14. The teeth 14 can be provided by laser cutting and/or grinding.

Figures 6-14 show different stages in the manufacture and milling operation of a saw blade according to an embodiment of the invention.

Figure 6 shows a side sectioned view tooth mounted in a recess before the milling operation.

Figure 7 is a base view of the saw tooth of Figure 6.

Figure 8 is a top view of the saw tooth of Figure 6.

Figure 9 is a side sectioned view of the saw tooth of Figures 6-8 after being processed by a first grinding operation.

Figure 10 is a base view of the saw tooth of Figure 9.

Figure 11 is a top view of the saw tooth of Figure 9.

Figure 12 is a side sectioned view of the saw tooth of Figures 6-11 after being processed by a second grinding operation.

Figure 13 is a base view of the saw tooth of Figure 12.

Figure 14 is a top view of the saw tooth of Figure 13.

Referring to Figures 6-14 a method of forming finished saw teeth is shown in three stages. Figures 6-8 show a saw tooth "blank" 16 inserted into the pre-pressed recess 4. This "blank" 16 is placed in the recess at an angle of substantially 30° to the horizontal line of the recess 4 although the angle may be varied according to requirements.

The tapered shape of the saw tooth 16 produces a facet or cutting angle whereby the wider portion is placed pointing forward to produce the tip of the tooth.

Figures 9-11 show the saw tooth 16 after a first milling operation which cuts the front of the tooth 16 and the top of an adjacent tooth (not shown). This produces cutting angles on the top surface of the blade and the sides thereof.

After this grinding operation at the top and back of the tooth 16, the portion of the tooth at the base 18 of the grind is narrower than the tip 20. This is because the tooth 16 was placed at an angle to the grind. Thus at this stage of the milling operation four facets have been created, top, back and two side facets or cutting angles.

The next grinding operation, processes the sides of the teeth 16,

removing excess carbide not used for cutting. This is a simple grinding operation along the whole sides of the blade, processing all the individual saw teeth 16.

The result of these grinding processes is a complex multifacted tooth. Previously this was only achieved by individual grinding of facets.

The teeth 16 of the present invention are advantageously created as the result of the position, shape and angle of the carbide insert and by "gang" milling, i.e. multiple milling in one operation, of the carbide. This process cuts many teeth in one operation and produces at least four facets.

It is to be appreciated that the embodiments of the invention described above with reference to the accompanying drawings has been given by way of example only and that modifications may be effected. Thus, for example, material other than rolled steel for the support strip 2 may be employed. The recess 4 may be other than the illustrated V-shape so that, for example, the recess 4 may be U-shaped. The material used for forming the teeth 14 may be other than tungsten. A saw set may be induced by local bending and the support strip 2 may be regarded as being a backing strip.

CLAIMS:-

1. A method of making a saw blade, which method comprises forming at least one recess along an edge of a support strip, and securing in the recess at least one material providing, or enabling the provision of, a sawing edge.

2. A method according to claim 1 in which the recess is formed in the edge of the support strip by rolling.

3. A method according to claim 1 or claim 2 in which the recess is a V-shaped recess.

4. A method according to claim 1 or claim 2 in which the recess is a U-shaped recess.

5. A method according to claim 1 or claim 2 in which the recess is part-circular in cross section.

6. A method according to any one of the preceding claims in which a plurality of individual saw teeth are inserted into the recess to provide the sawing edge.

7. A method according to claim 6 in which the individual saw teeth are made of diamond, tungsten carbide, a sintered metal, a sintered ceramic material, or mixtures of these materials.

8. A method according to any one of claims 1 to 5 in which the recess is filled with tungsten powder, the tungsten powder is subsequently compressed and sintered to form a hardened edge to the support strip, and saw teeth are formed in the hardened edge.

9. A method according to claim 8 in which the saw teeth are formed by cutting or grinding.

10. A method according to claim 9 in which the sintering and the tooth cutting are achieved by means of at least one of a laser beam, diamond grinding and wire erosion.

11. A method according to any one of claims 1 to 5 in which the recess is filled with a mixture of tungsten grit and braze material, the mixture is subsequently heated to form a hardened edge, and saw teeth are formed in the hardened edge.

12. A method according to claim 11 in which the saw teeth are cut by at least one of a laser beam, diamond grinding, wire erosion, and grinding.

13. A method according to any one of claims 1 to 5 in which the recess has inserted therein a plurality of shorter lengths of tungsten carbide strip, separated from one another.

14. A method as claimed in claim 13 in which the lengths of tungsten carbide strip are attached to the support strip by at least one of brazing, welding and fusing.

15. A method according to claim 13 or claim 14 in which the tungsten strips have teeth formed in them prior to assembly with the support strip.

16. A method according to claim 13 or claim 14 in which the teeth are cut in the tungsten strips after assembly with the support strip.

17. A method according to any one of the preceding claims in which the recess is mechanically closed on the material provided, enabling the provision of, the sawing edge.

18. A method of making a saw blade substantially as herein described with reference to the accompanying drawings.

19. A method of making a saw blade as claimed in any one of the preceding claims wherein a plurality of individual saw teeth are inserted into the recess at an angle to the recess.

20. A method of making a saw blade as claimed in claim 19 wherein the teeth are formed by cutting or grinding such that more than one tooth is cut or ground simultaneously.

21. A method of making a saw blade as claimed in claims 19 or 20 wherein a first grinding operation forms a saw tooth wherein the portion of the tooth at the lowermost portion of the ground material is narrower than the top portion.

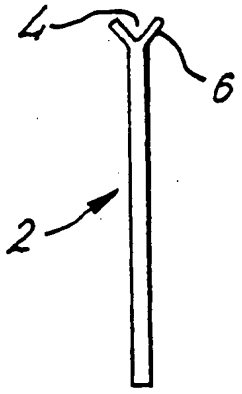


FIG. 1

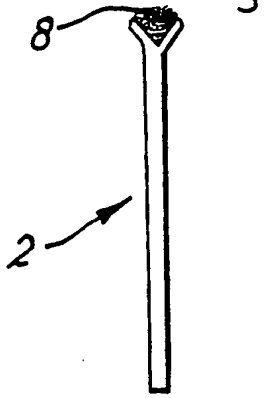


FIG. 2

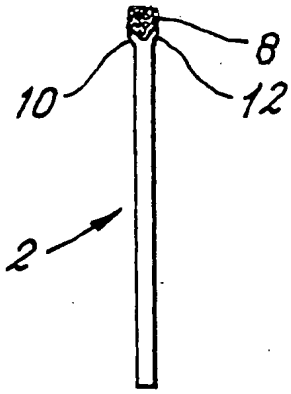


FIG. 3

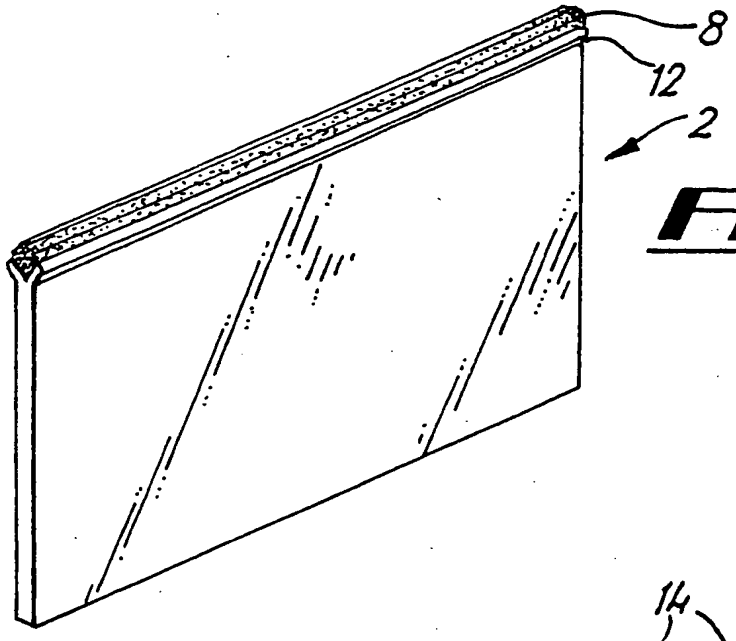


FIG. 4

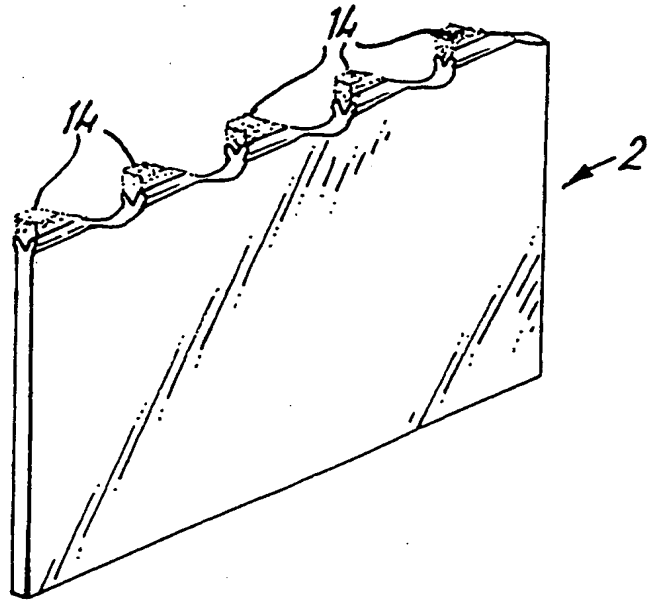
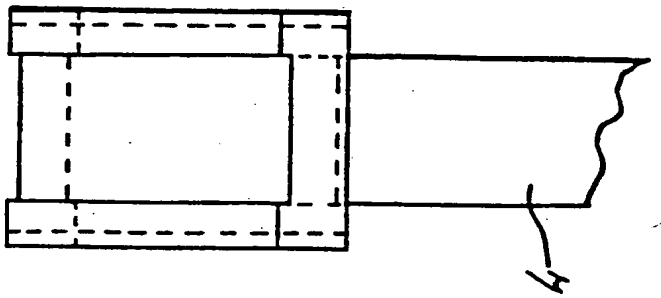
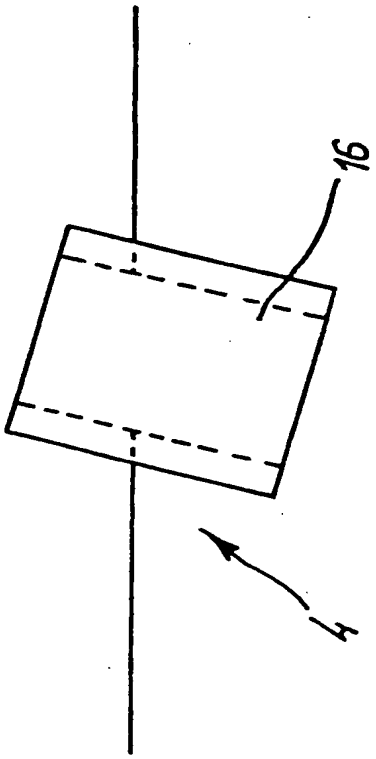


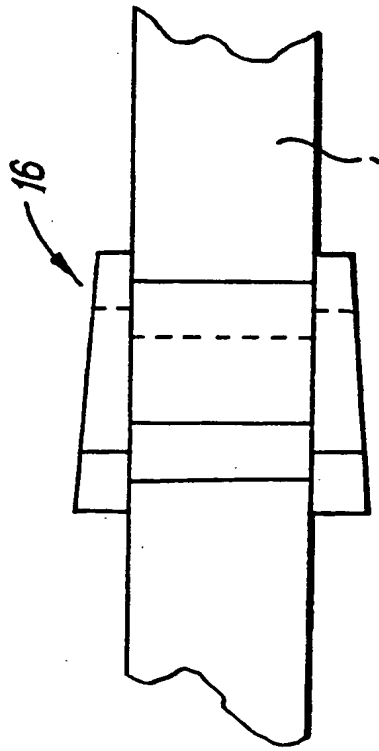
FIG. 5



Фиг.7



Фиг.6



Фиг.8

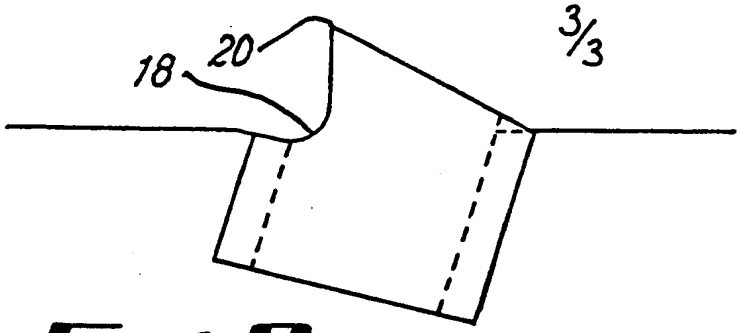


FIG. 9

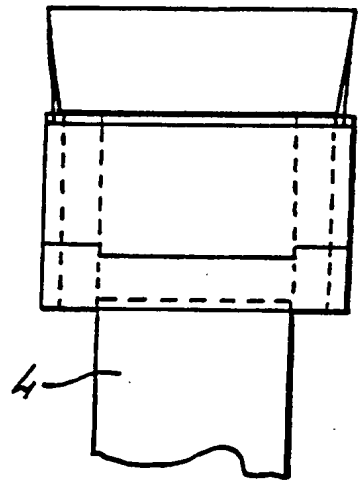


FIG. 10

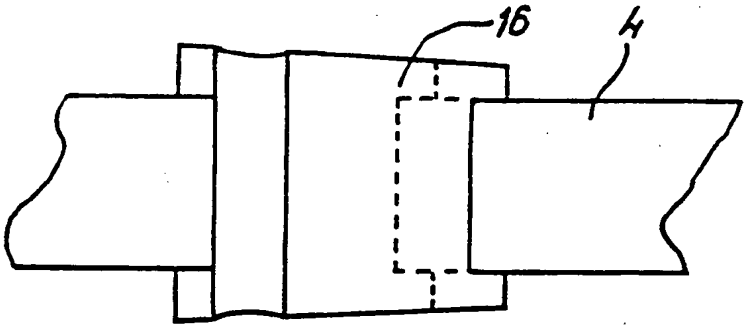


FIG. 11

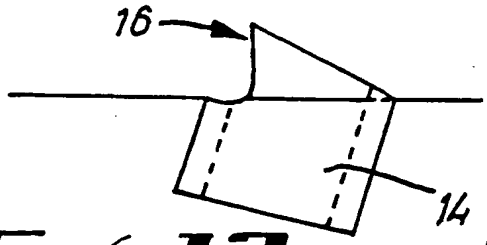


FIG. 12

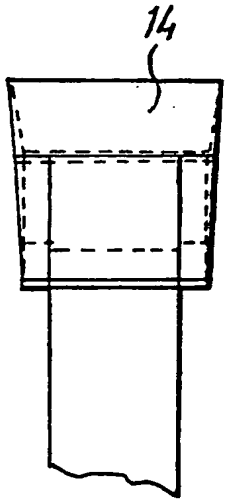


FIG. 13

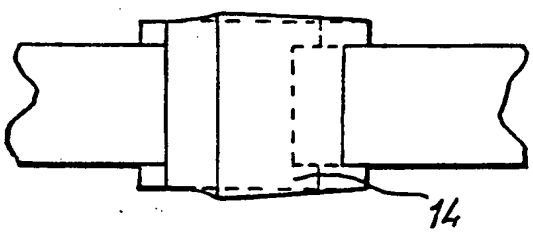


FIG. 14

INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/GB 00/02577

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B23D65/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 835 734 A (ARTHUR G ET AL) 17 September 1974 (1974-09-17) claim 1	1
A	US 1 952 002 A (TREMBOUR) 20 March 1934 (1934-03-20) claim 1	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
12 October 2000	23/10/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Gussem, J

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INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Intern al Application No
PCT/GB 00/02577

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3835734 A	17-09-1974	GB 1403192 A	28-08-1975
		SE 384162 B	26-04-1976
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